The Motion of 20 Draconis.   By S. W. Burnham.

Although this double star ($\Sigma\, 2118$) was discovered by William Herschel more than one hundred years ago, it has received but little attention from observers in recent years. Within the last thirty years it has been close and rather difficult, but before 1860 it was easily measurable with almost any telescope. During this period the distance was slowly diminishing, while the angle remained nearly constant. For the past ten years it has been too close to be seen with any but the most powerful refractors.

I have collected all the observations with the micrometer which have any value, and give them below in chronological order for convenience in future investigations. I have omitted all negative results where the star was noted as " round," " single," " elongated," &c., since it is evident that it has never been really single, and the failures to see it were due to insufficient optical power, or unfavourable atmospheric conditions.

1783·26	251·5	...	♅	1*n*
1830·32	242·6	0·63	H	1*n*
1831·37	246·1	0·70	H	1*n*
1832·30	246·4	0·85	Σ	5*n*
1834·57	252·0	...	Da	1*n*
1836·75	247·0	0·71	Σ	3*n*
1840·77	242·9	...	Da	1*n*
1841·24	245·3	0·77	OΣ	3*n*
1843·32	248·4	0·8	Ma	1*n*
1847·71	243·3	...	Mh	2*n*
1847·97	244·6	0·65	Ma	2*n*
1854·81	241·7	0·61	Da	3*n*
1857·35	240·1	0·37	Se	3*n*
1859·67	235·7	0·58	OΣ	2*n*
1872·42	238·0	0·27	OΣ	1*n*
1874·73	224·0	...	N	1*n*
1877·13	229·4	0·28	De	3*n*
1880·82	211·3	0·20	β	4*n*
1889·45	140·7	0·11	β	3*n*
1891·33	125·6	0·11	β	3*n*

All of these measures are laid down accurately to scale on the accompanying diagram, except the observations of Herschel, Dawes, Mitchell, and Newcomb, where the distance was not measured. It is obvious at a glance that these positions taken together furnish no evidence whatever of orbital motion so far

as their direction is concerned. A straight line will better represent them than any curve. The chances are enormously in favour of this being a physical system, and I have no doubt that will be shown to be the fact, but at present it is more a matter of probability than anything else. If these stars were a considerable distance apart, there would be hardly any doubt that the relative movement was due to proper motion. The two components, as one star, have a proper motion of $0''\!\cdot\!227$ in the direction of $79°\!\cdot\!3$, and this angle corresponds very nearly to the motion of B with respect to A. A line drawn through the observed positions of B, making an angle of $73°$ with the meridian, will represent the measures as closely as they are ever represented by a line of any character in stars of this class. To be sure, the later observations appear to indicate an accelerated motion, as would be expected if the path is a very elongated ellipse, but the errors in the series generally are so large it is impossible to deduce any harmonious result. Taking the mean of Struve's measures to represent the place of B at the mean date ($1834\!\cdot\!5$), the movement of that star to $1891\!\cdot\!3$ is $0''\!\cdot\!86$, giving an average of $0''\!\cdot\!015$ per annum. If it is moving around the primary, as is most probably the case, it is evident that the apparent ellipse is one of extraordinary elongation. There is nothing like it known in the heavens. The period is certainly several hundred years. In one or two years more, the measures will definitely settle the character of this motion. It will probably be a difficult object for some time to come, and should be carefully measured by observers having sufficiently powerful instruments.

It will be noticed that the same grouping of positions, and apparent reversal of motion, occurs here in the first eight measures, which I have shown elsewhere is found in the measured places of all slow-moving pairs.

Lick Observatory :
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The Companions to Regulus.   By S. W. Burnham.

The distant companion to *Regulus* was first observed by Herschel I. in 1779, and catalogued as No. 11 of his Class VI. It was measured on one night, but the distance was about $8''$ too small. In 1821 it was better observed by South and Herschel, but the accurate measures commence with the observations of Struve a few years later. The measures of the last fifty years show conclusively that this companion has the same proper motion as *Regulus*, which has a motion in space of $0''\!\cdot\!267$ annually in the direction of $274°\!\cdot\!5$. Since the measures of Struve